DOCUMENT RESUME

ED 351 863 FL 020 723

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TITLE The Boswell Computer System and Its Effect on English as a Second Language Acquisition.
PUB DATE 23 Jul 92
NOTE 27p.
PUB TYPE Reports - Evaluative/Feasibility (142)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Adult Education; Adult Students; *Computer Assisted Instruction; *Courseware; *English (Second Language); *Equipment Evaluation; Instructional Effectiveness; Instructional Material Evaluation; Intensive Language Courses; Language Tests; Phonics; *Phonology; *Pronunciation Instruction; Second Language Learning; Student Attitudes; Testing
IDENTIFIERS *Boswell English as a Second Language Program

ABSTRACT

A study investigated the instructional effectiveness of the Boswell English as a Second Language Program, a phonics-based language teaching program using interactive, multisensory (auditory, visual, tactile) computer technology. The program is a sequence of lessons designed to give non-native speakers an understanding of English phonological structure and its relationship to spelling. Subjects were 10 adult students of varying language backgrounds and skill levels in an intensive English-as-a-Second-Language program, and a parallel control group. Both groups were pre- and posttested using the Basic English Skills Test (BEST) and a Boswell-designed test of the material covered in the program. The experimental group used the system from 24 to 42.5 hours. Test results indicate that the Boswell system had a significant impact on students' ability to recognize and discriminate phonemes as well as on their spelling abilty. However, little correlation was found between time spent using the system and improvement on the Boswell aural test. The experimental group performed better on the Boswell written test but not on the BEST written examination. Students who used the program were generally positive about the system and visibly engaged by it. Students had some criticisms of the program and suggestions for its improvement. (MSE)

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The Boswell Computer System and its Effect on English as a Second Language Acquisition

Lesley A. Rawling, B.A.(Linguistics), B.Ed.

23 July, 1992

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Abstract

The Boswell System for phonological acquisition was tested to determine if use of the system would result in significant improvement in English skills. The system was tested on an experimental group of ten adult English as a Second Language students, both male and female, of varying English ability and first language background. There was a parallel control group. Both groups were pre- and post-tested using the Basic English Skills Test and a Boswell-designed test of the material specifically covered in the program. The experimental group used the system from 24 to 42.5 hours.

Post-testing showed a significant improvement in the experimental group in terms of aural sound discrimination and spelling. Student comments regarding the system were in general very positive.

INTRODUCTION

The acquisition of a good pronunciation in a second language is considered to be the most difficult task in language learning. It is essential for students to learn the sound system of English or they will not be understood. A good grasp of grammar and vocabulary is rendered ineffective if poor pronunciation makes speech unintelligible.

Aural recognition of a sound and discrimination between similar sounds is the first step in acquiring good pronunciation. This is a very difficult task for students whose mother tongue doesn't have a particular sound or sound combination. Students must be able to distinguish sounds before they are able to produce them.

One of the major causes of poor pronunciation is interference from spelling. Conversely, spelling is adversely affected by poor pronunciation. By pairing the sounds of the language with the written word the student is able to "break the code" of English spelling by determining which sounds can be represented by a given sequence of letters.

In a multi-cultural classroom setting, it would be impossible to address adequately the specific problems of each linguistic group. Students all have different areas of difficulty in pronunciation and learn at a different rates. For these reasons pronunciation is well served by the individual-based computer system.

SYSTEM DESCRIPTION

The Boswell system is a phonics-based language teaching program based on interactive, multi-sensory (auditory, visual, and tactile) computer technology.

The Boswell English as a Second Language Program is a sequence of lessons designed to allow non-native speakers to develop an understanding of the phonetic structure of the English language and of how sound relates to spelling.

Lessons begin simply and become more complex as more and more phonemes are introduced. In each practice exercise, phonemes are heard first in isolation and then within words. As the lessons progress, phrases and then sentences are included. Lessons build upon previous lessons so that the sounds and words of previous lessons are reviewed and reinforced.

In the first half of the program, the vowels and all of the single consonant sounds are introduced. The mid-point review includes theme-based practice, idioms, and a dialogue.

Consonant blends and clusters are included in the second half of the program along with separate lessons on voiced and unvoiced consonant pairs, and letters which represent more than one sound or do not have a sound of their own. The end of course review includes more theme-based practice, idioms, and tongue twisters.

Students are encouraged to practice the sounds as they learn them by subvocal repetition. They can repeat exercises if they wish to review.

METHOD

Apparatus:

The physical components of the system consist of the unique Boswell keyboard which is based on the use of phonemes, accompanying software, and a system for generating voice output.

The Boswell keyboard uses 24 keys to create the phonemes of Canadian English. Each phoneme is produced by pressing one or more keys. Phonemes are joined together into syllables and words by entering the phonemes that compromise that syllable or word. The fingers of the left hand press the initial consonant or cluster of the syllable, the thumbs of both hands press the vowel, and the fingers of the right hand press the closing consonant or cluster. The individual component phonemes are pressed together and released simultaneously, like playing a chord on a piano.

Subjects:

The Boswell System was tested on a group of adult English as a Second Language students at a private language teaching institution in Vancouver, British Columbia, Canada. They were all participants in a five-month intensive English course designed to help them function and work effectively in the Canadian environment. The students, both male and female, were all landed immigrants.

A group of students was chosen on the basis of the length of time they would continue to study at the school. This allowed an adequate length of time for the research to be conducted. Students at the beginner-level were excluded because the reading component of the program would have been too difficult for them.

The twenty students chosen for the study came from a wide variety of language backgrounds: Polish, Vietnamese, Farsi, Mandarin, Cantonese, Spanish, and Korean. They had been in Canada for from six months to eight and one-quarter years (on average 1.8 years). Their level of education ranged from eight years of school to seventeen years, with the majority having a high school education. Their previous English training ranged from 11 years in public school in Hong Kong to none.

The twenty students were in three classes at different levels: upper-beginner, lower-intermediate, and intermediate (levels determined by school criteria). The students at each level were assigned to the experimental and control groups randomly. There were equal numbers of students in both groups with approximately the same range of levels.

Procedure :

Each of the twenty students chosen was pre-tested using the Basic English Skills Test (BEST) from the Center of Applied Linguistics, Washington and a Boswell in-house test.

The BEST Test (Form B) is a standardized test designed to test listening comprehension, speaking, reading, and writing skills at a basic level. The test has a written and oral component. This test was used to determine the students' entry levels in order to ensure that the experimental and control groups were balanced in terms of levels. It was also used to determine if use of the Boswell System had a significant impact on overall English ability.

The Boswell In-house Test (Form A) was designed specifically to test the material taught in the Boswell System: sound discrimination, spelling, and comprehension of specific vocabulary items. The test has a written and an aural component.

Both the experimental and the control groups continued with classroom English training. The experimental group substituted one hour per day of class time with one hour of using the Boswell System. Apart from this one hour per day the two groups received the same training.

The students in the experimental group worked on the Boswell System independently and at their own speed. They followed written instructions on the computer screen. A supervisor was in the room at all times in order to answer student questions and to solve any technical problems that might arise.

The study was conducted over a period of nine weeks. This gave students who attended the sessions everyday the opportunity of having 45 hours of Boswell System time. Due to absenteeism, the actual number of hours of system time ranged from 20.75 to 42.5 hours with an average of 32.4 hours.

One student in the experimental group dropped out of the school entirely and was replaced by another student. This latter student had been in the intermediate class and had just finished his five-month program. Therefore, he was no longer attending classes. Because of a more flexible schedule, he was able to spend 1 1/2 - 2 hours per day on the system. He was able to complete 20.75 hours of system time in only 4 weeks.

At the end of the nine-week test period the students were post-tested to determine if use of the Boswell System had had an effect on the improvement of the experimental group. The battery of tests which was administered consisted of the BEST Test and the Boswell In-house Test.

The BEST Test (Form C) was given to measure the change in overall English ability over the test period. The Boswell In-house Test (Form B) was given as a post-test to determine any improvement specifically in the material taught in the Boswell System: sound discrimination, spelling, and comprehension of specific vocabulary items.

RESULTS

The results of the pre- and post-tests were subjected to statistical analysis to determine if there was a significant difference between the experimental and control groups which could be attributed to the use of the Boswell System.

A One-way Analysis of Variance (ANOVA) of the Boswell Aural Test results revealed a significant Test x Group interaction (P is less than or equals .005). A Tukey Post-hoc test showed a significant difference between scores. This means that, in terms of aural sound discrimination and spelling, the group which had used the Boswell system showed a highly significant improvement in score compared with the control group (see Figure 1). There was, however, no direct correlation between improvement in Boswell Aural test scores and time spent using the Boswell system.

The same statistical analysis (ANOVA) of the scores for the Boswell Written Test and the BEST Written and Oral Tests showed no significant differences between the two groups. On the Boswell Written Test the Boswell group had a mean improvement of 3.2 points and the control group a mean improvement of 0.8 points. The results of the oral component of the BEST were a mean 15.9 point improvement for the Boswell group and 8.7 points for the control group. The BEST written section showed a mean improvement of 0.0 points for the Boswell group and 2 points for the control group. Because the differences between the scores of the two groups were not found to be significant, it cannot be conclusively shown that these differences were not due to experimental error, such as sampling error, environmental effects, or chance.

DISCUSSION

The test results indicate that the use of the Boswell System had a significant impact on the students' ability to recognize and discriminate phonemes, as well as on their spelling ability. The improvement in spelling can be assumed to be due to improved understanding of the link between spelling and pronunciation. As these are essential components of English, the Boswell System has been shown to be effective as a component of an English course.

The lack of correlation between time spent using the Boswell system and improvement on the Boswell Aural Test can be attributed to differences in attentiveness, motivation, and innate ability between the students.

Factors affecting the post-test results are fatigue resulting from five months of intensive study, lack of attentiveness because of excitement due to the impending end of the course, and the fact that the post-testing was conducted during a heat wave when the classroom temperature was uncomfortably high.

The students who used the program were generally positive about the system and visibly engaged by it. In an evaluation of the system at the end of the study, all of the ten students in the Boswell group said that they had made improvement. All of them said that their pronun-

ciation had improved. Eight students said that their vocabulary and listening had improved. Seven thought that there had been an improvement in spelling. Five said they had improved in understanding and four in sentences. Two students felt that their grammar had improved.

In response to whether or not they enjoyed using the system and liked the lessons, four students answered "yes" and six students said "maybe". Six students said "yes" when asked if they had improved quickly, three said "maybe", and one "no". Nine of the ten students felt that the Boswell System had been helpful and one student was unsure.

The students had some criticism of the program and suggestions for its improvement. Two of the students reported that the keyboard was difficult to remember and that they were sometimes confused. Another two students felt that the time they had worked on the system was too short. Two students mentioned that the slow speed of the punctuation prompts was a problem. Three students complained of unclear sound in the final lessons of the program.

One student found that the Boswell System on top of classes resulted in too much information to absorb and that the system time would have been more effective at a later date.

Some of the students' suggestions for improvement of the program were: on-screen diagrams of the points of articulation, varying visuals for increased interest, a glossary of vocabulary items, modelling of sentence intonation, and interactive voice which would allow the students to hear their own pronunciation and to compare it to the model.

Despite the effectiveness of the Boswell system there are a number of problem areas. On a technical level, the voice that is heard is not always clear and, particularly in the later lessons, is obscured by interference by machine noise.

There are still a number of programming errors, though a great many have been cleared up in the course of this study. There are errors where the voice file does not match the actual pronunciation of the word, where the voice file does not match the keying prompt, where the voice and the graphics are out of synchronization, and other such problems. These "glitches" can be removed by careful scanning of the program for such errors.

Each lesson begins with the presentation of a phoneme in isolation. Though different theories argue for and against the presentation of phonemes in isolation, in the Boswell program the presentation of the individual sounds, without the visual cues of the position of the lips and mouth, serves little purpose. The sounds in isolation are difficult to distinguish, even for a native speaker. They are often distorted by interference from computer noise. The sounds are much clearer and easier to differentiate in the context of words and minimal pairs.

When the phonemes of a particular syllable are keyed in correctly the student hears the pronunciation of that syllable. However, when the wrong keys are pressed, due to mistaken pronunciation or merely due to a keying error, the sounds represented by each of the keys pressed are heard in sequence rather than together as a syllable. This serves no instructional purpose as the student does not even hear the actual sound of the keys pressed. Also it is quite frustrating to repeatedly hear the sound of these mistakes, particularly when it is just a keying

error. Once one key has been pressed the user cannot change responses without hearing the sound of the error.

There are some inconsistencies regarding the standard of pronunciation used. This is, no doubt, due to the inconsistencies in the pronunciation of Canadian English. An example of this is the word "new" which is presented in the program as both [nu] and [nyu]. There are also inconsistencies in syllabification; the division of syllables is sometimes inaccurate and the same word may be broken into syllables in different ways in different lessons. This is extremely confusing to the student. A standard reference for Canadian pronunciation and syllabification, such as the Collins Dictionary of Canadian English, should be adopted to avoid such inconsistencies.

In the middle of the program punctuation is introduced. Though it is useful for the student to be aware of the position of punctuation in a sentence, accessing punctuation in the program is very slow. Apparently the computer must search each voice file before it can indicate a punctuation mark. This slows down progress considerably and adds an element of frustration.

The program is designed for students to work through in sequence, building on knowledge gained from previous lessons. Though this format has been shown to be effective, the amount of time necessary to work through the program is not always available. It would be useful if independent lessons dealing with specific pronunciation problems, and requiring only basic knowledge of the keyboard, were developed. This would allow teachers and students the freedom to work on specific areas of difficulty without it being necessary to commit the time required to complete the entire program.

It is generally held that comprehensible input is essential for learning and retention. To be of maximum benefit, the input should be just a little beyond the student's present language level. Given this tenet, the Boswell Program is most effective for students at the intermediate level or above. Students who are at a lower level will have difficulty understanding the vocabulary presented and, therefore, will learn and retain less. To benefit the students at the lower level, the program could be modified using a smaller vocabulary pool.

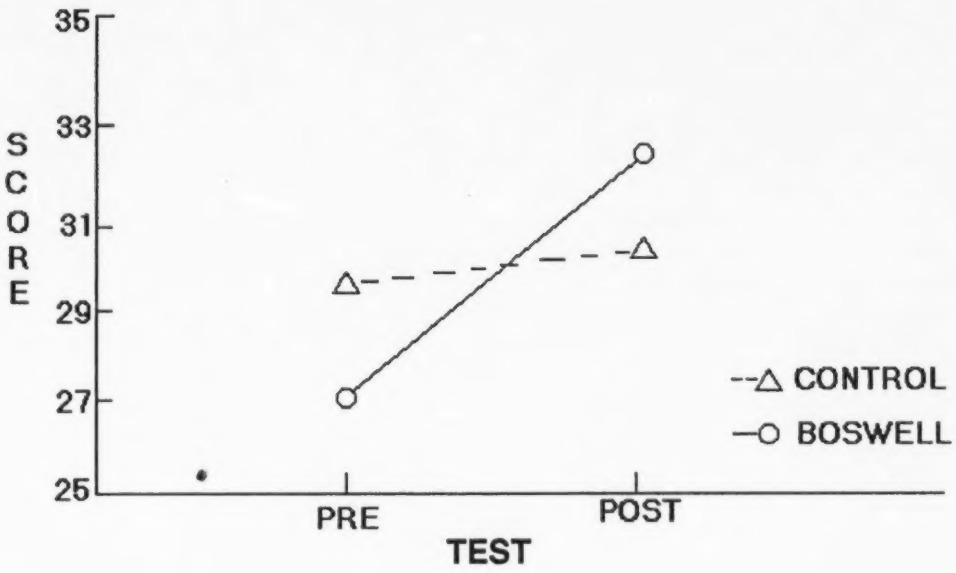
Lesley A. Rawling, B.A.(Linguistics), B.Ed.

Ms. Rawling received her B.A. and B.Ed degrees from the University of Victoria. Her degree in Linguistics includes a specialization in English as a Second Language. She has taught English as a Second Language in both Japan and Canada for a period of seven years. She has an interest in and some experience with the use of computers in the English as a Second Language classroom.

Ms. Rawling currently teaches both immigrants and overseas students from the beginner to the advanced levels.

Figure 1:

The Effect of the Boswell System on In-house Test Scores



TEST REPORT FOLLOW-UP

This document is a Company response to sections of the report titled "The Boswell Computer System and its Effect on English as a Second Language Acquisition". This paper addresses issues raised in the "Discussion" section of the Report.

A number of issues mentioned by the students and included in the Report have been, or are being, addressed.

1. In the Student Evaluation two students felt that their grammar had improved (Page 6, Paragraph 1). As the Program is not designed to teach grammar any recognition of improvement in this aspect of language instruction is a credit to the platform and the course materials.

2. Two students reported that the keyboard was difficult to remember (Page 6, Paragraph 3). As on a standard QWERTY keyboard, it is necessary for students to learn and remember the positions of the keys. On the Boswell, however, learning the key assignments is more than a rote skill. Learning the key positions is an integral part of the System because the student not only sees and hears the sound but is able to develop a tactile relationship with and therefore use this sense to physically distinguish this sound from similar sounds.

3. Student-suggested improvements to the Program (Page 6, Paragraph 4) include

   - screen diagrams of the points of articulation.
   - varied visuals for increased interest.
   - a dictionary.
   - interactive voice.

   These improvements to the Program are at the planning stages and will be incorporated into the software as the resources to do so become available.

   The prototype for the incorporation of interactive voice has been developed. It is currently being refined and integrated into the courseware. In addition, work is under way to include a graphic representation and comparison of the students pronunciation beside the correct pronunciation.

4. Unclear sound files (Page 6, Paragraph 3): the new voice files are to be recorded on high quality digital audio tape (DAT) which consistently produces excellent sound.

5. Programming errors (Page 6, Paragraph 7) which affect voice files, prompts and graphics are being eliminated.

6. The presentation of phonemes (Page 6, Paragraph 8) in isolation: it has been the long-standing belief that the presentation of isolated phonemes, particularly conso-

nants, has been impossible or at least extremely difficult. Isolated phonemic elements have therefore not been included in language learning curricula. With the Boswell platform this is now possible. User comment on the effectiveness of presenting discrete phonemes has been mixed, clearly indicating the need for more user testing.

7. The response of the program to incorrect key presses (Page 6, Paragraph 9) has been and continues to be reviewed. There has been both positive and negative feedback about a computer response which voices the correct phonemes pressed even though the overall key press is incorrect. User feedback will ultimately resolve this issue.

8. The problems caused by inconsistencies in pronunciation and syllabification (Page 7, Paragraph 2) are being reduced.

   Pronunciation: The Collins dictionary of Canadian English was incorporated as a pronunciation guide later in the testing program. Generally, the program reflects mid-North American pronunciation and it will continue to be refined to reflect Canadian "standard".

   Syllabification: problems with syllabification are sometimes tied to errors within the program, but more frequently are related to the fact that standard syllabification (and therefore hyphenation) rules reflect the way language is written and presented on the printed page rather than the way it is spoken. The Boswell program generally breaks down words into their spoken syllables. However, there are times, based on sound educational principles and practice, when this general rule is not followed. For example, the word "thinking" is formed from the root word "think" and the suffix "-ing". The spoken word is pronounced "thin-king", which conflicts with accepted hyphenation rules which breaks the word down as "think-ing". Learning a root word and its accompanying suffixes, however, is an important component of any English language program. The benefits gained by the student from learning the root and its suffix outweigh, in this instance, the subtle distinction between the spoken and written syllabification of the word. For this reason, the word "thinking", and others like it, are divided according to written rather than spoken guidelines.

   In cases where the syllabification for the same word has varied within the program, corrections have been made so that the word is always broken down in the same way.

9. Independent Lessons: "The program is designed for students to work through in sequence.....it would be useful if independent lessons dealing with specific pronunciation problems" were included (Page 7, Paragraph 3).

   The Program which was installed at the testing site was a comprehensive program designed to teach students all the phonemes of the language. It is not difficult to develop a program which addresses specific pronunciation problems and does not

require the user to learn the whole program. This can be done immediately, pending resources.

10. The report states (Page 7, Paragraph 5) that the Boswell Program is most effective for students at the intermediate level or above. This is based on learning and selection criteria at the test site school and reflects the Boswell Program as it was tested. Beginners can and do have a powerful language learning experience.

STATISTICAL SUMMARY

WELC STUDY

Date: ***July 13th, 1992***
Entered by: ***S.L. Gray***
Checked by: ***L.R. Allnutt***

WELC STUDY OF THE BOSWELL ESL PROGRAM - LEVEL I

Raw Test Results:

IN HOUSE TEST - WRITTEN SECTION

STUDENT NUMBER	TIME ON BOSWELL	PHONEME RECOGNITION (vowel sounds)				GRAMMAR AND SYNTAX				
		Pre-test score	Post test score	Raw change	Percent change	Pre-test score	Post test score	Raw change	Percent change	
92-010		3/10	4/10	1		7/10	7/10	0		CONTROL GRP
92-012		9/10	8/10	<1>		9/10	10/10	1		
92-014		10/10	7/10	<3>		9/10	10/10	1		
92-016		5/10	1/10	<4>		6/10	7/10	1		
92-018		3/10	3/10	0		6/10	10/10	4		
92-020		5/10	6/10	1		9/10	9/10	0		
92-022		5/10	6/10	1		8/10	10/10	2		
92-024		0/10	1/10	1		7/10	5/10	<2>		
92-026		3/10	4/10	1		7/10	8/10	1		
92-028		1/10	4/10	3		9/10	8/10	<1>		
AVERAGED TOTALS:				0	9.00%			.70	7.00%	
MEDIAN INCREASE:										
STANDARD DEVIATION:										
92-011	37.10	3/10	5/10	2		9/10	8/10	<1>		BOSWELL GRP
92-013	25.20	3/10	5/10	2		6/10	9/10	3		
92-015	39.25	4/10	7/10	3		9/10	10/10	1		
92-017	36.30	4/10	6/10	2		5/10	9/10	4		
92-019	33.55	4/10	4/10	0		6/10	5/10	<1>		
92-021	33.25	0/10	0/10	0		5/10	8/10	3		
92-023	32.40	5/10	6/10	1		9/10	10/10	1		
92-025	42.30	7/10	9/10	2		9/10	9/10	0		
92-027	20.45	5/10	8/10	3		8/10	9/10	1		
92-029	24.25	5/10	2/10	<3>		9/10	7/10	<2>		
AVERAGED TOTALS:				1.20	12.00%			.90	9.00%	
MEDIAN INCREASE:										
STANDARD DEVIATION:										

WELC STUDY OF THE BOSWELL ESL PROGRAM - LEVEL I

Raw Test Results:

IN HOUSE TEST - WRITTEN SECTION

STUDENT NUMBER	TIME ON BOSWELL	SYLLABLE STRESS RECOGNITION				COMPREHENSION OF IDIOMS				
		Pre-test score	Post test score	Raw change	Percent change	Pre-test score	Post test score	Raw change	Percent change	
92-010		3/5	4/5	1		1/4	2/4	1		C
92-012		5/5	5/5	0		1/4	3/4	2		O
92-014		4/5	5/5	1		4/4	4/4	0		N
92-016		5/5	0/5	<5>		3/4	4/4	1		T
92-018		3/5	4/5	1		2/4	4/4	2		R
92-020		3/5	3/5	0		3/4	2/4	<1>		O
92-022		3/5	3/5	0		4/4	2/4	<2>		L
92-024		5/5	3/5	<2>		3/4	3/4	0		G
92-026		3/5	4/5	1		3/4	4/4	1		R
92-028		3/5	4/5	1		3/4	2/4	<1>		P
AVERAGED TOTALS:				<.20>	-4.00%			.30	7.50%	
MEDIAN INCREASE:										
STANDARD DEVIATION:										
92-011	37.10	2/5	4/5	2		3/4	3/4	0		B
92-013	25.20	4/5	4/5	0		3/4	3/4	0		O
92-015	39.25	3/5	5/5	2		2/4	2/4	0		S
92-017	36.30	5/5	4/5	<1>		3/4	2/4	<1>		W
92-019	33.55	5/5	4/5	<1>		0/4	2/4	2		E
92-021	33.25	3/5	4/5	1		1/4	3/4	2		L
92-023	32.40	3/5	5/5	2		2/4	2/4	0		L
92-025	42.30	4/5	5/5	1		3/4	4/4	1		G
92-027	20.45	2/5	3/5	1		2/4	2/4	0		R
92-029	24.25	3/5	3/5	0		4/4	4/4	0		P
AVERAGED TOTALS:				.70	14.00%			.40	10.00%	
MEDIAN INCREASE:										
STANDARD DEVIATION:										

WELC STUDY OF THE BOSWELL ESL PROGRAM - LEVEL I

Raw Test Results:

IN HOUSE TEST - WRITTEN SECTION

STUDENT NUMBER	TIME ON BOSWELL	TOTALS			
		Pre-test score	Post test score	Raw change	Percent change
92-010		14	17	3	
92-012		24	26	2	
92-014		27	26	<1>	
92-016		19	12	<7>	
92-018		14	21	7	
92-020		20	20	0	
92-022		20	21	1	
92-024		15	12	<3>	
92-026		16	20	4	
92-028		16	18	2	
AVERAGED TOTALS:				.80	
MEDIAN INCREASE:					
STANDARD DEVIATION:					

92-011	37.10	17	20	3	
92-013	25.20	16	21	5	
92-015	39.25	18	24	6	
92-017	36.30	17	21	4	
92-019	33.55	15	15	0	
92-021	33.25	9	15	6	
92-023	32.40	19	23	4	
92-025	42.30	23	27	4	
92-027	20.45	17	22	5	
92-029	24.25	21	16	<5>	
AVERAGED TOTALS:				3.20	
MEDIAN INCREASE:					
STANDARD DEVIATION:					

WELC STUDY OF THE BOSWELL ESL PROGRAM - LEVEL I

Raw Test Results:

IN HOUSE TEST - AURAL SECTION

STUDENT NUMBER	TIME ON BOSWELL	PHONEME RECOGNITION (opening consonant sounds)				PHONEME RECOGNITION (closing consonant sounds)				
		Pre-test score	Post test score	Raw change	Percent change	Pre-test score	Post test score	Raw change	Percent change	
92-010		6/9	7/9	1		10/10	8/10	<2>		CONTROL GRP
92-012		6/9	8/9	2		9/10	8/10	<1>		
92-014		8/9	9/9	1		9/10	9/10	0		
92-016		6/9	6/9	0		10/10	9/10	<1>		
92-018		6/9	6/9	0		6/10	8/10	2		
92-020		8/9	8/9	0		8/10	8/10	0		
92-022		7/9	8/9	1		10/10	10/10	0		
92-024		7/9	6/9	<1>		7/10	8/10	1		
92-026		6/9	5/9	<1>		7/10	7/10	0		
92-028		5/9	3/9	<2>		9/10	7/10	<2>		
AVERAGED TOTALS:				.1	1.11%			<.3>	<2.0%>	
MEDIAN INCREASE:										
STANDARD DEVIATION:										
92-011	37.10	6/9	9/9	3		10/10	9/10	<1>		BOSWELL GRP
92-013	25.20	5/9	7/9	2		7/10	8/10	1		
92-015	39.25	8/9	8/9	0		8/10	8/10	0		
92-017	36.30	2/9	4/9	2		8/10	9/10	1		
92-019	33.55	7/9	7/9	0		10/10	8/10	<2>		
92-021	33.25	6/9	6/9	0		9/10	8/10	<1>		
92-023	32.40	6/9	8/9	2		5/10	9/10	4		
92-025	42.30	9/9	9/9	0		9/10	10/10	1		
92-027	20.45	7/9	8/9	1		9/10	9/10	0		
92-029	24.25	4/9	3/9	<1>		6/10	5/10	<1>		
AVERAGED TOTALS:				.9	10.0%			.2	2.0%	
MEDIAN INCREASE:										
STANDARD DEVIATION:										

WELC STUDY OF THE BOSWELL ESL PROGRAM - LEVEL I

Raw Test Results:

IN HOUSE TEST - AURAL SECTION

STUDENT NUMBER	TIME ON BOSWELL	VERBATIM RECORDING OF LIVE SPEECH				VOCABULARY COMPREHENSION				
		Pre-test score	Post test score	Raw change	Percent change	Pre-test score	Post test score	Raw change	Percent change	
92-010		11.00/15	12.00/15	1.00		5/6	3/6	<2>		CONTROL GRP
92-012		10.25/15	11.25/15	1.00		2/6	3/6	1		
92-014		13.00/15	13.50/15	.50		4/6	5/6	1		
92-016		9.25/15	9.00/15	<.25>		3/6	4/6	1		
92-018		10.50/15	11.25/15	.75		4/6	6/6	2		
92-020		11.75/15	13.00/15	1.25		5/6	6/6	1		
92-022		13.25/15	14.00/15	.75		6/6	6/6	0		
92-024		9.75/15	10.00/15	.25		5/6	6/6	1		
92-026		9.00/15	10.00/15	1.00		4/6	6/6	2		
92-028		8.50/15	10.00/15	1.50		5/6	4/6	<1>		
AVERAGED TOTALS:				.77[illegible]	7.75%			.600	10.00%	
MEDIAN INCREASE:										
STANDARD DEVIATION:										
92-011	37.10	10.50/15	13.75/15	3.25		5/6	5/6	0		BOSWELL GRP
92-013	25.20	10.25/15	12.00/15	1.75		3/6	5/6	2		
92-015	39.25	12.25/15	12.75/15	.50		5/6	6/6	1		
92-017	36.30	8.00/15	9.75/15	1.75		4/6	4/6	0		
92-019	33.55	8.50/15	10.00/15	1.50		1/6	4/6	3		
92-021	33.25	6.00/15	9.25/15	3.25		2/6	3/6	1		
92-023	32.40	12.25/15	13.75/15	1.50		5/6	6/6	1		
92-025	42.30	11.25/15	12.50/15	1.25		4/6	6/6	2		
92-027	20.45	9.00/15	12.00/15	3.00		3/6	5/6	2		
92-029	24.25	9.25/15	11.50/15	2.25		4/6	5/6	1		
AVERAGED TOTALS:				2.06	13.34%			1.30	21.67%	
MEDIAN INCREASE:										
STANDARD DEVIATION:										

WELC STUDY OF THE BOSWELL ESL PROGRAM - LEVEL I

Raw Test Results:

IN HOUSE TEST - AURAL SECTION

STUDENT NUMBER	TIME ON BOSWELL	TOTALS			
		Pre-test score	Post test score	Raw change	Percent change
92-010		32.00	30.00	<2.00>	
92-012		27.25	30.25	3.00	
92-014		34.00	36.50	2.50	
92-016		28.25	28.00	<0.25>	
92-018		26.50	31.25	4.75	
92-020		32.75	35.25	2.25	
92-022		36.25	38.00	1.75	
92-024		28.75	30.00	1.25	
92-026		26.00	28.00	2.00	
92-028		27.50	24.00	<3.50>	
AVERAGED TOTALS:				1.175	
MEDIAN INCREASE:					
STANDARD DEVIATION:					

92-011	37.10	31.50	36.75	5.25	
92-013	25.20	25.25	32.00	6.75	
92-015	39.25	33.25	34.75	1.50	
92-017	36.30	22.00	26.75	4.75	
92-019	33.55	26.50	29.00	2.50	
92-021	33.25	23.00	26.25	3.25	
92-023	32.40	28.25	36.75	8.50	
92-025	42.30	33.25	37.50	4.25	
92-027	20.45	28.00	34.00	6.00	
92-029	24.25	23.25	24.50	1.25	
AVERAGED TOTALS:				4.48	
MEDIAN INCREASE:					
STANDARD DEVIATION:					

WELC STUDY OF THE BOSWELL ESL PROGRAM - LEVEL I

Raw Test Results:

BASIC ENGLISH SKILLS TEST (BEST) - WRITTEN SECTION

STUDENT NUMBER	TIME ON BOSWELL	WRITING SKILLS				READING COMPREHENSION				
		Pre-test score	Post test score	Raw change	Percent change	Pre-test score	Post test score	Raw change	Percent change	
92-010		23	21	<2>		39	42	3		CONTROL GRP
92-012		17	23	6		36	41	5		
92-014		29	27	<2>		48	44	<4>		
92-016		16	13	<3>		30	31	1		
92-018		27	26	<1>		39	37	<2>		
92-020		26	26	0		39	43	4		
92-022		29	29	0		47	45	<2>		
92-024		16	17	1		29	31	2		
92-026		20	24	4		33	37	4		
92-028		24	29	5		33	34	1		
AVERAGED TOTALS:				.80				1.20		
MEDIAN INCREASE:										
STANDARD DEVIATION:										
92-011	37.10	22	27	5		37	35	<2>		BOSWELL GRP
92-013	25.20	18	20	2		36	40	4		
92-015	39.25	29	27	<2>		48	41	<7>		
92-017	36.30	29	25	<4>		33	35	2		
92-019	33.55	9	11	2		25	22	<3>		
92-021	33.25	11	16	5		34	34	0		
92-023	32.40	28	25	<3>		45	43	<2>		
92-025	42.30	28	27	<1>		42	43	1		
92-027	20.45	28	29	1		44	43	<1>		
92-029	24.25	27	26	<1>		30	34	4		
AVERAGED TOTALS:				.40				<4.0>		
MEDIAN INCREASE:										
STANDARD DEVIATION:										

WELC STUDY OF THE BOSWELL ESL PROGRAM - LEVEL I

Raw Test Results:

BASIC ENGLISH SKILLS TEST (BEST) - WRITTEN SECTION

STUDENT NUMBER	TIME ON BOSWELL	TOTALS			
		Pre-test score	Post test score	Raw change	Percent change
92-010		62	63	1	
92-012		53	64	11	
92-014		77	71	<6>	
92-016		46	44	<2>	
92-018		66	63	<3>	
92-020		65	69	4	
92-022		76	74	<2>	
92-024		45	48	3	
92-026		53	61	8	
92-028		57	63	6	
AVERAGED TOTALS:				2.00	
MEDIAN INCREASE:					
STANDARD DEVIATION:					

92-011	37.10	59	62	3	
92-013	25.20	54	60	6	
92-015	39.25	77	68	<9>	
92-017	36.30	62	60	<2>	
92-019	33.55	34	33	<1>	
92-021	33.25	45	50	5	
92-023	32.40	73	68	<5>	
92-025	42.30	70	70	0	
92-027	20.45	72	72	0	
92-029	24.25	57	60	3	
AVERAGED TOTALS:				0.00	
MEDIAN INCREASE:					
STANDARD DEVIATION:					

WELC STUDY OF THE BOSWELL ESL PROGRAM - LEVEL I

Raw Test Results:

BASIC ENGLISH SKILLS TEST (BEST) - ORAL SECTION (Interview)

STUDENT NUMBER	TIME ON BOSWELL	LISTENING COMPREHENSION				VERBAL COMMUNICATION				
		Pre-test score	Post test score	Raw change	Percent change	Pre-test score	Post test score	Raw change	Percent change	
92-010		8	6	<2>		35	40	5		CONTROL GRP
92-012		5	7	2		29	27	<2>		
92-014		7	9	2		40	46	6		
92-016		4	9	5		21	36	15		
92-018		6	9	3		37	31	<6>		
92-020		8	9	1		39	41	2		
92-022		5	9	4		44	46	2		
92-024		4	3	<1>		24	28	4		
92-026		6	8	2		33	34	1		
92-028		3	6	3		21	27	6		
AVERAGED TOTALS:				1.90				3.80		
MEDIAN INCREASE:										
STANDARD DEVIATION:										
92-011	7.10	5	9	4		23	40	17		BOSWELL GRP
92-013	25.20	8	9	1		35	39	4		
92-015	39.25	9	8	<1>		37	40	3		
92-017	36.30	9	9	0		43	45	2		
92-019	33.55	2	8	6		15	35	20		
92-021	33.25	5	9	4		21	36	15		
92-023	32.40	7	9	2		37	43	6		
92-025	42.30	7	8	1		36	39	3		
92-027	20.45	8	7	<1>		42	42	0		
92-029	24.25	4	7	3		32	42	10		
AVERAGED TOTALS:				1.90				8.00		
MEDIAN INCREASE:										
STANDARD DEVIATION:										

WELC STUDY OF THE BOSWELL ESL PROGRAM - LEVEL I

Raw Test Results:

BASIC ENGLISH SKILLS TEST (BEST) - ORAL SECTION (Interview)

STUDENT NUMBER	TIME ON BOSWELL	FLUENCY			
		Pre-test score	Post test score	Raw change	Percent change
92-010		15	17	2	
92-012		11	13	2	
92-014		23	20	<3>	
92-016		0	20	20	
92-018		18	7	<11>	
92-020		15	22	7	
92-022		21	21	0	
92-024		3	13	10	
92-026		14	19	5	
92-028		11	14	3	
AVERAGED TOTALS:				3.50	
MEDIAN INCREASE:					
STANDARD DEVIATION:					

92-011	37.10	6	23	17	
92-013	25.20	15	20	5	
92-015	39.25	22	24	2	
92-017	36.30	15	22	7	
92-019	33.55	1	10	9	
92-021	33.25	0	17	17	
92-023	32.40	20	10	<10>	
92-025	42.30	13	16	3	
92-027	20.45	19	19	0	
92-029	24.25	10	20	10	
AVERAGED TOTALS:				8.00	
MEDIAN INCREASE:					
STANDARD DEVIATION:					

WELC STUDY OF THE BOSWELL ESL PROGRAM - LEVEL I

Raw Test Results:

BASIC ENGLISH SKILLS TEST (BEST) - ORAL SECTION (Interview)

STUDENT NUMBER	TIME ON BOSWELL	TOTALS			
		Pre-test score	Post test score	Raw change	Percent change
92-010		58	63	5	
92-012		45	47	2	
92-014		70	75	5	
92-016		25	65	40	
92-018		61	47	<14>	
92-020		62	72	10	
92-022		70	76	6	
92-024		31	44	13	
92-026		53	61	8	
92-028		35	47	12	
AVERAGED TOTALS:				8.70	
MEDIAN INCREASE:					
STANDARD DEVIATION:					

92-011	37.10	34	72	38	
92-013	25.20	58	68	10	
92-015	39.25	68	72	4	
92-017	36.30	67	76	9	
92-019	33.55	18	53	35	
92-021	33.25	26	62	36	
92-023	32.40	64	62	<2>	
92-025	42.30	56	63	7	
92-027	20.45	69	68	<1>	
92-029	24.25	46	69	23	
AVERAGED TOTALS:				15.90	
MEDIAN INCREASE:					
STANDARD DEVIATION:					